



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/646,897	08/22/2003	Warren M. Farnworth	01-1059.1	1324
22823	7590	08/10/2005	EXAMINER	
STEPHEN A GRATTON THE LAW OFFICE OF STEVE GRATTON 2764 SOUTH BRAUN WAY LAKEWOOD, CO 80228			LEWIS, MONICA	
			ART UNIT	PAPER NUMBER
			2822	

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/646,897	FARNWORTH ET AL.	
	Examiner	Art Unit	
	Monica Lewis	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 170-179 is/are pending in the application.
- 4a) Of the above claim(s) 153-169 and 180-188 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 170-179 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>8/03;3/04;1/05;6/5</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the election filed June 3, 2005.

Election/Restrictions

2. Applicant's election with traverse of Embodiment II in the reply filed on 6/3/05 is acknowledged. The traversal is on the ground that Embodiments I and II are the same species. However, this is not found persuasive. This is not found persuasive because Embodiment I clearly recites a structure that is independent and distinct from Embodiment II. For example, in claim 153 of embodiment I the back side of the die is thinned unlike claim 170. Additionally, in claim 153 the first polymer layer covers the circuit side and the edges however in claim 170 the first polymer layer covers the circuit side, the contact bumps and peripheral edges.

The requirement is still deemed proper and is therefore made FINAL.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.
4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Drawings

5. The drawings are objected to because figures 22a-22f are cutoff and distorted. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is

Art Unit: 2822

being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

6. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: a) 44-BE (See Figure 10); b) 3A (See Figure 2A); c) 3B (See Figure 2B); d) 3C (See Figure 2C); d) 36P-E (See Figure 1L); e) 30-E (See Figure 1N); f) 26-E (See Figure 1N); g) 68AP (See Figure 8E); h) 28ap-b (See Figure 11B); i) 70A-A (See Figure 11A); j) 49F (See Figure 11F); k) 14IP (See Figure 12A); l) 20DT (See Figure 17G); m) 17J (See Figure 17I); n) 12T-PGA (See Figure 19C); and o) 26PGA (See Figure 19F). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in

Art Unit: 2822

the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 170-175 are rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Liu et al. (U.S. Patent No. 6,841,413) and Wakabayashi et al. (U.S. Patent No. 6,607,970).

In regards to claim 170, Kinsman et al. ("Kinsman") discloses the following:

a) a semiconductor die having a circuit side, a back side, four peripheral edges, and a plurality of die contacts (12) (For Example: See Figure 2 and Column 4 Lines 53-55);

b) a plurality of contact bumps (20) on the die contacts (For Example: See Figure 2);

c) a first polymer layer (30) covering the circuit side and the contact bumps (For Example: See Figure 2);

d) a second layer (30) covering the back side (For Example: See Figure 2); and

e) a plurality of terminal contacts (32) on the contact bumps (For Example: See Figure 2).

In regards to claim 170, Kinsman fails to disclose the following:

a) a thinned die.

Art Unit: 2822

However, Liu et al. ("Liu") discloses a semiconductor device that has a thinned die (200) (For Example: See Abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a thinned die as disclosed in Liu because it aids in providing easier formation for build-up layers (For Example: See Column 2 Lines 58-60).

Additionally, since Kinsman and Liu are both from the same field of endeavor, the purpose disclosed by Liu would have been recognized in the pertinent art of Kinsman.

b) first polymer layer covers the four peripheral edges.

However, Wakabayashi discloses a semiconductor device where the first polymer layer (13) covers the four peripheral edges (For Example: See Figure 15). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a polymer layer that covers the edges as disclosed in Wakabayashi because it aids in preventing water or moisture from entering (For Example: See Column 4 Lines 35-43).

Additionally, since Kinsman and Wakabayashi are both from the same field of endeavor, the purpose disclosed by Wakabayashi would have been recognized in the pertinent art of Kinsman.

In regards to claim 171, Kinsman discloses the following:

a) the contact bumps and the first polymer layer are planarized to a same surface (For Example: See Figure 1D).

Additionally, the following limitation makes it a product by process claim: a) "planarized to a same surface." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product

Art Unit: 2822

itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 172, Kinsman discloses the following:

a) the contact bumps comprise metal bumps (For Example: See Column 4 Lines 62-64).

In regards to claim 173, Kinsman discloses the following:

a) the terminal contacts comprise conductive bumps or balls (For Example: See Column 8 Line 23).

In regards to claim 174, Kinsman discloses the following:

a) the first polymer layer has a planarized first surface (For Example: See Column 6 Lines 20-22).

Additionally, the following limitation makes it a product by process claim: a) "planarized surface." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The

Art Unit: 2822

patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

In regards to claim 175, Kinsman disclose the following:

a) the second polymer layer has a planarized second surface (For Example: See Column 6 Lines 20-22).

Additionally, the following limitation makes it a product by process claim: a) "planarized surface." The MPEP § 2113, states, "Even though product -by[-] process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

A "*product by process*" claim is directed to the product per se, no matter how actually made, *In re Hirao and Sato et al.*, 190 USPQ 15 at 17 (CCPA 1976) (footnote 3). See also *In re Brown and Saffer*, 173 USPQ 685 (CCPA 1972); *In re Luck and Gainer*, 177 USPQ 523 (CCPA 1973); *In re Fessmann*, 180 USPQ 324 (CCPA 1974); and *In re Marosi et al.*, 218 USPQ 289 (CAFC 1983) final product per se which must be determined in a "*product by, all of*" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "*product by process*" claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

9. Claim 176 and 177 are rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Liu et al. (U.S. Patent No. 6,841,413), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Farnworth et al. (U.S. Patent No. 6,620,731).

In regards to claim 176, Kinsman fails to disclose the following:

a) a plurality of conductive vias in electrical communication with the die contacts and with the terminal contacts.

However, Farnworth et al. ("Farnworth") discloses a semiconductor device that utilizes a plurality of conductive vias (30) in electrical communication with contacts (38) (For Example: See Figures 1A-1G). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a plurality of conductive vias as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

Additionally, since Kinsman and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Kinsman.

In regards to claim 177, Kinsman fails to disclose the following:

a) a plurality of second die contacts on the second polymer layer in electrical communication with conductive vias.

However, Farnworth discloses a semiconductor device that has a plurality of second die contacts (40) on the second polymer layer (22) in electrical communication with conductive vias (30) (For Example: See Figures 1A-1G). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a plurality of contacts on the polymer layer as disclosed in Farnworth because it aids in providing electrical communication between the integrated circuit and the contacts (For Example: See Abstract).

Additionally, since Kinsman and Farnworth are both from the same field of endeavor, the purpose disclosed by Farnworth would have been recognized in the pertinent art of Kinsman.

10. Claim 178 is rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Liu et al. (U.S. Patent No. 6,841,413), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Akram (U.S. Patent No. 6,544,821).

In regards to claim 178, Kinsman fails to disclose the following:

a) the second polymer layer comprises a photopolymer.

However, Akram discloses a semiconductor device that utilizes a photopolymer (For Example: See Column 7 Line 31). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a photopolymer layer as disclosed in Akram because it aids in protecting the device (For Example: See Column 7 Lines 31 and 32).

Additionally, since Kinsman and Akram are both from the same field of endeavor, the purpose disclosed by Akram would have been recognized in the pertinent art of Kinsman.

11. Claim 179 is rejected under 35 U.S.C. 103(a) as obvious over Kinsman et al. (U.S. Patent No. 6,717,245) in view of Liu et al. (U.S. Patent No. 6,841,413), Wakabayashi et al. (U.S. Patent No. 6,607,970) and Gilleo et al. (U.S. Patent No. 6,228,678).

In regards to claim 179, Kinsman fails to disclose the following:

a) the second polymer layer comprises a wafer level underfill.

However, Gilleo et al. ("Gilleo") discloses a semiconductor device that has polymer that comprises an underfill material (For Example: See Column 4 Lines 17 and 18). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor of Kinsman to include a polymer layer that comprises an underfill as disclosed in Gilleo because it aids in minimizing thermal fatigue (For Example: See Column 1 Lines 60-66).

Additionally, since Kinsman and Gilleo are both from the same field of endeavor, the purpose disclosed by Gilleo would have been recognized in the pertinent art of Kinsman.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838.

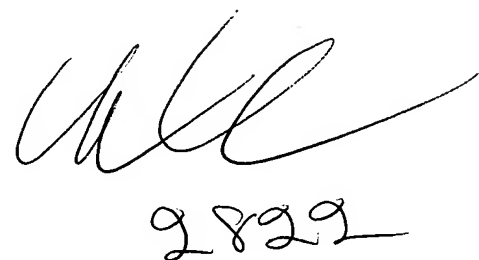
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300 for regular and after final

Art Unit: 2822

communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956

ML

August 7, 2005

A handwritten signature, possibly reading 'ML', is written above the number '2822'.